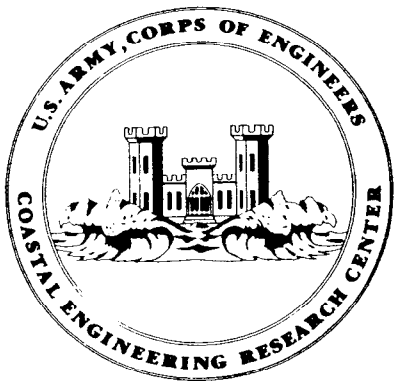

Coastal Engineering Technical Note

EFFECTS OF A SINGLE JETTY ON A TIDAL NAVIGATION CHANNEL

PURPOSE: To provide planning and design guidance on the response of a tidal navigation channel to the construction of a single jetty. It is important in the early stages of planning, to understand the effects that the construction of a single jetty can have on the migration and ultimate positioning of the navigation channel.

BACKGROUND: Past practice has been to stabilize inlets with either single or double jetties. A case history study of jettied entrances (Kieslich, 1981) demonstrated the response of a channel in a tidal inlet to the construction of a single jetty.

A single jetty system may have the jetty on either the updrift or downdrift side of the inlet. A single updrift jetty acts as a barrier to the littoral drift moving in the net transport direction. A downdrift jetty permits the sand from the updrift side of the inlet to encroach upon the navigation channel. The figure shows the expected response of an inlet system due to the construction of a single updrift or downdrift jetty.

EFFECTS OF SINGLE JETTIES: The construction of a single jetty influences such inlet characteristics as the magnitude and direction of tidal currents, both riverine and littoral sediment deposition patterns, and wave and littoral current patterns. Four major elements of a tidal inlet that respond to this interaction are: Channel thalweg (defined as a line connecting the greatest depths along an inlet channel), channel shoaling, ebb tidal delta, and adjacent shoreline.

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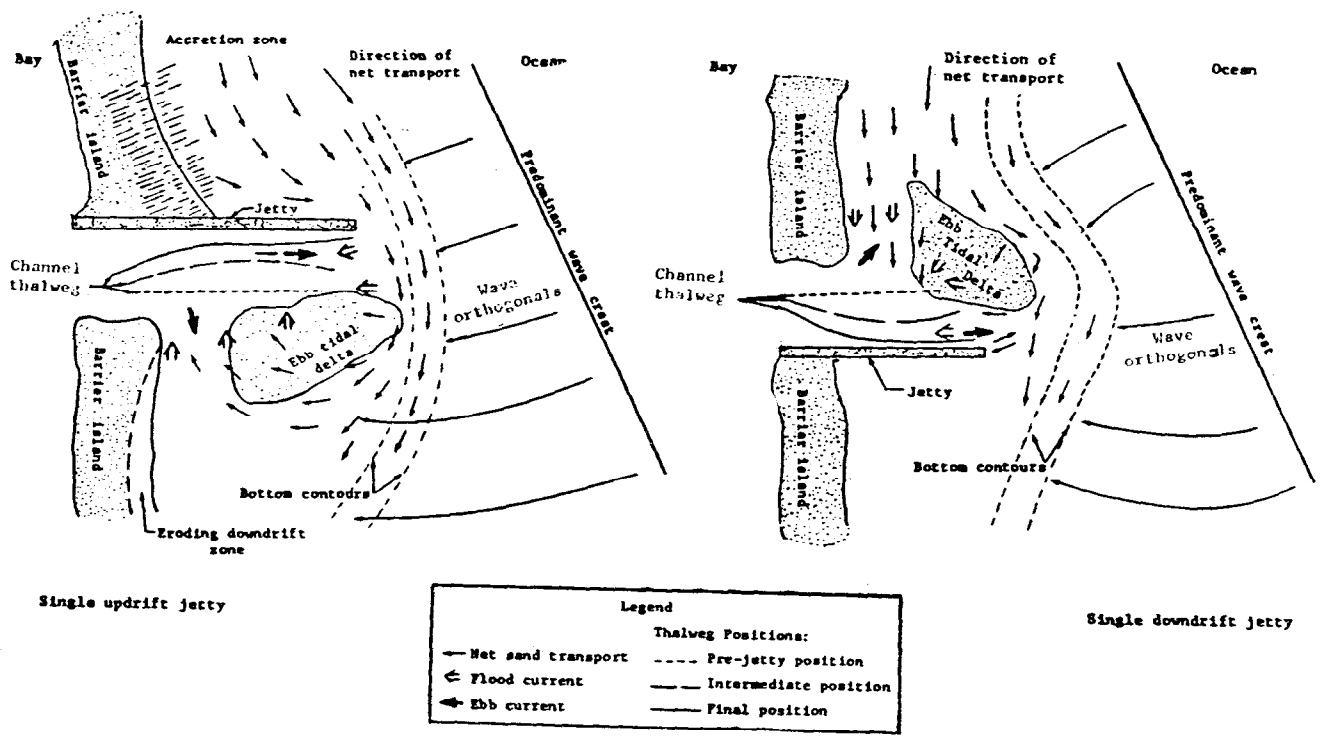

Figure. Effect of Single Jetty on a Tidal Inlet System

1. Channel Thalweg. For both types of jetty systems, the channel thalweg migrates towards the jetty. This migration happens regardless of the inlet-bay orientation, the angle the jetty makes with the shoreline, the position of the jetty relative to the direction of new longshore sediment transport, the ratio of net to gross sediment transport, or the gross sediment transport.

The rate at which the channel migrates towards the jetty is a function of the longshore sediment transport. The maximum rates of migration are typically found at the seaward end of the jetty and usually occur shortly after construction.

2. Channel Shoaling. The study indicates that a single jetty does not prevent shoaling in the entrance channel or stabilize the channel thalweg position, until the channel is up against the jetty.

3. Ebb Tidal Delta. The ebb tidal delta moves seaward as the construction of a single jetty moves seaward.

4. Adjacent Shoreline. As with any jetty system, the general trend with an updrift jetty system is for the updrift beach to accrete and the downdrift beach to erode and the rate of accretion or erosion depends on longshore transport rates and the length, elevation, and orientation of the jetty. There is insufficient data on the overall shoreline changes associated with a single downdrift jetty stystem to draw any conclusions.

CONCLUSIONS:

1. The construction of either an updrift or a downdrift single jetty generally results in the migration of the channel towards the jetty.

2. Because the channel position (thalweg) migrates towards the jetty, it is expected that periodic dredging would be required to improve navigation conditions.

3. Generally, it is necessary to build a second jetty at a later date to further stabilize the channel.

ADDITIONAL INFORMATION: For additional information contact Lee Weishar, Coastal Engineering Research Center (WESCR-PT) (601) 634-2073.

REFERENCE:

KIELSLICH, J.M., "Tidal Inlet Responses to Jetty Construction," GITI-19, U.S. Army Coastal Engineering Research Center, Fort Belvoir, VA and Waterways Experiment Station, Vicksburg, MS., October 1981.